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ABSTRACT

An investigation of two approaches to individualized computer-assisted instruction in ESL (English as a Second Language) was conducted. One treatment group, consisting of two university students, received exclusively product-oriented feedback, while the other group of two students received exclusively process-oriented feedback. In the product-oriented group, conferences centered on feedback from an experimental text analysis program, IBM's Critique. Tutoring in the other group centered on the use of a word-processing program for generating and revising content and organization. Subjects met individually with the tutor and wrote the same number of drafts on the same general topics. It was found that the group using the text analysis program and receiving exclusively product-oriented feedback produced a higher proportion of short sentences, shorter drafts, and fewer meaningful revisions than the group receiving process-oriented feedback. Both groups expressed positive attitudes overall, though the degree of positive reaction in the text analysis group diminished somewhat in the course of the study. (22 references) (Author/SD)

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The Computer as Writing Tutor: Is There a Place in the Process For Computer-Based Text Analysis?

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Abstract

An investigation of two general approaches to individualized computer-assisted instruction in ESL composition was conducted. One treatment group, consisting of two university students, received exclusively product-oriented feedback, while the other group of two students received exclusively process-oriented feedback. In the product-oriented group, conferences centered on feedback from an experimental text analysis program, IBM's Critique. Tutoring in the other group centered on the use of a word-processing program for generating and revising content and organization. Subjects met individually with the tutor and wrote the same number of drafts on the same general topics. It was found that the group using the text analysis program and receiving exclusively product-oriented feedback produced a higher proportion of short sentences, shorter drafts, and fewer meaningful revisions that the group receiving process-oriented feedback. Both groups expressed positive attitudes overall, though the degree of positive reaction in the text analysis group diminished somewhat in the course of the study.

Though computer-based writing aids in general, and word processing in particular, have received accolades from numerous teachers and students alike, research exploring the effectiveness of computer-based writing has uncovered results which are, at best, mixed. Kiefer (1987) decries the lack of good research of computer-based writing, warning that computerized writing cannot be heralded unquestioningly as the panacea for students' composing problems. She claims, among other things, that "the research-based studies do not offer unqualified support for word processing" (1987, p. 24). Piper, on the other hand, asserts that "the word processor not only facilitates the process of moving from a first draft through a process of evaluation and redrafting to a final draft, it also seems to promote it quite spontaneously" (1987, p. 124). Similar sweeping claims endorsing or condemning computer-based writing aids are common, yet the sum of research justifies a medial position at most.

Much of the research conducted on the use of computer-based writing aids has focused on the amount and types of revision that word processing encourages. The results, again, are mixed. Daiute (1984) found that writers using word processing made more changes than those using paper and pen. No difference in the quality of the writing of writers using either technique was detected, however. Collier (1983), whose research focused on inexperienced writers, and Lutz (1983) found similar results: writers using word processing made more changes than

those using pen and paper, but the changes did not qualitatively improve the writers' compositions. Research by Harris (1985) and Daiute (1986), on the other hand, uncovered negative results. Their studies indicated that writers using word processing revised less than those writers using traditional means. Harris even warned that word processing seemed to discourage substantial revisions among the inexperienced writers in her study (1985, p. 330). Though little consensus exists in the research-based studies conducted to date concerning the amount and effectiveness of revisions students produce using word processing, researchers generally agree that the act of revision itself, at least, is facilitated by computer technology, as "writers can insert, delete, and substitue text with an ease hitherto unknown" (Hawisher, 1987, p. 145). Conclusions claiming benefits for word processing other than a physical or logistic one seem, at this juncture at least, tentative.

A relatively new computerized writing aid that is beginning to draw interest and some initial research is computer-based text analysis. Computer-based text analysis, or text analysis software, uses computer technology to analyze a text and provide concrete advice for improvement. Ten years ago, only a few such text analysis programs had been developed. McDaniel's (1987) bibliography of computer-based writing aids lists over two dozen such programs which are already widely available. The sophistication of these programs ranges from the rudimentary, which may provide the writer little more than the number of

words, sentences, and paragraphs in a text, to the more sophisticated, which can analyze natural language, providing an analysis of grammar, punctuation, word choice, and other elements composing a text. One program, IBM's Critique, even parses sentences, detailing what parts of speech the words making up a sentence fill.

The bulk of research exploring computer-based text analysis has focused on the use of a set of programs called Writer's Workbench at Colorado State University. Writer's Workbench is a program developed at Bell Laboratories which was originally intended for use by technical writers. The program has been altered to make it better suited for university English courses at Colorado State.

The Workbench programs are grouped into three principal components: Proofreading, Style, and Organization (Cherry et al., 1983). Proofreading is actually "five separate programs that check for spelling errors, consecutive occurrences of the same word, punctuation errors, faulty phrasing, and split infinitives" (Cherry et al., 1983, p. 11). The Style programs provide a great deal of statistical analysis, much of which is based on readability indices. It also underlines all forms of "be" verbs, as "be" occurs with passives, nominalizations and expletives--constructions, according to the program, writers may want to eliminate. Style highlights abstract words, comparing the words in a text to a dictionary of abstract words. Organization simply reformats the text, deleting everything but

headings and the first and last sentences of each paragraph. This format is intended to help the writer view the structure of a text.

Research at Colorado State University has focused on the implementation of Writer's Workbench as an integral part of the English composition program. That research has championed several positive claims as to the utility of computer-based text analysis. Researchers at Colorado State have advocated the use of Writer's Workbench for both first and second language writers (Kiefer and Smith, 1983; Reid, 1986). One general argument in favor of computer-based text analysis has been the positive reaction of writers using Writer's Workbench. "Most users feel that it's much better to have immediate computer feedback on writing--especially from a machine that doesn't frown at you when it criticizes" (Cherry et al., 1983, p. 14). Cherry et al. (1983) also found unanimous faculty support. "Department faculty with no background in computers or terminals now consider the Writer's Workbench system an indispensable adjunct to classroom instruction" (Cherry et al., 1983, p. 16). Of course, the important question is not whether students and faculty react positively to computer-based text analysis. As significant as such responses may be, the important question is whether or not the program works. Does computer-based text analysis provide any verifiable benefits to the writer who uses the program?

As with other research-based studies evaluating computer-based writing aids, any answer must be qualified. Early studies

at Bell Laboratories indicated that writers "using Writer's Workbench not only edit more thoroughly but also learn to edit on their own" (Gingrich et al. cited in Kiefer and Smith, 1983, p. 201). Evaluation of the program at Colorado State suggests that "textual analysis with computers intrigues college writers and speeds learning of editing skills by offering immediate, reliable, and consistent attention to surface features" (Kiefer and Smith, 1983, p. 202). Kiefer claims there is some evidence that the use of computer-based text analysis prompts writers to go beyond surface-level editing to make content revisions, such as changes in meaning, focus and voice (1987, p. 25). Her claims, however, are weakened by the fact that subjects in her study revised their computer-analyzed compositions with the assistance and input of an instructor. The computer analysis was used as a point of departure rather than the focus for revision. It is impossible, as Kiefer admits (1987, p. 25), to attribute to computer-based text analysis the higher level content revisions her subjects made.

A study investigating the effect of computer-based text analysis on ESL writers was also conducted at Colorado State University (Reid, 1986). ESL students enrolled in a non-credit English composition course used Writer's Workbench during one school semester. Their progress was tracked and compared with that of a control group that did not use the program. Results indicated that ESL writers using Writer's Workbench "improved their editing and writing skills significantly, whereas students

who did not have access to the WWB (Writer's Workbench) did not improve their skills" (Reid, 1986, p. 179). However, variables other than computer-based text analysis, such as teacher-student conferences, classroom discussion of compositions, and motivational factors, may have affected the outcome of this study.

Results of studies examining computer-based text analysis are questionable because of the numerous variables affecting their outcome. The studies cited involved subjects enrolled in English composition classes who received feedback from the computer as well as feedback from instructors and/or peers. Isolating the effect of computer-based text analysis on the subjects' writing is difficult if not impossible--a fact the researchers themselves admit (Kiefer, 1987, p. 25; Reid, 1986, p. 173). Before claims can be made as to the utility of computer-based text analysis, research which attempts to isolate the exact effects of computer-based text analysis must be conducted. Only then can a place for computer-based text analysis be forwarded. The study outlined below is a first step in that direction.

Method

A study was conducted to determine the effect of computer-based text analysis on the writing of ESL students using the new IBM text analysis program, Critique. Critique, an experimental program developed at IBM's Watson Research Center, has been made

available recently to the English Department at the University of Hawaii. Though the program provides much of the same types of statistical analysis provided by Writer's Workbench and similar programs, Critique advances beyond "first generation" text analysis. It is the "first (computer-based text analysis) program that can cope with ill-formed sentences" (Creed and Kau, 1988, p. 62). It accomplishes this analysis by incorporating a "highly sophisticated, mainframe-based natural language parser and an algorithm for handling ungrammatical sentences: it relaxes its grammar rules one by one until it achieves a successful parse, then determines grammatical errors by noting which rules have been relaxed" (Creed and Kau, 1988, p. 63). According to Creed and Kau (1988), this parser is the only one designed thus far capable of dealing with ungrammatical sentences and providing assistance in correcting them.

To run Critique, the English Department at the University of Hawaii has connected four computer terminals (IBM XT's) to an IBM 3081 mainframe computer located in another building via telephone lines. Critique, which is a large and sophisticated program, requires the speed and power of a mainframe computer to accomplish its analyses. To access the program, users either type their compositions directly into a terminal or load a completed composition into the computer terminal. After a composition is typed or loaded into a terminal, it then can be uploaded, or transferred, to the mainframe computer for analysis by Critique.

Critique's analysis is activated by pressing a designated key on the computer terminal labeled "CRITIQUE." The analysis takes about one minute for a 500-word essay (Creed and Kau, 1988). After the program completes its analysis, it displays the results on the terminal monitor. Any problems Critique finds in a text are underscored, and a user can correct these as he see fits. The revised composition, along with the program's analysis, then can be downloaded to the computer terminal and saved on a computer diskette.

For their initial evaluation of Critique, the English Department designated two Spring 1988 freshman English composition classes for experimental use of the program. Forty disks or "places" were reserved on the mainframe computer, and each student enrolled in the two experimental classes was given a code word with which to access Critique. Two of those places were vacated early in the semester after two students dropped the course, presenting an opportunity for research with two ESL writers.

Introduction to the Study

The purpose of the study was to track the writing progress of two ESL 100 students using the text analysis program, Critique, and to determine what effect the program had on the subjects' writing. Three successive drafts of three compositions, each on the same general theme, were written by

participating subjects. The writing progress of a control group of two subjects writing with a word processor and receiving feedback characteristic of the "process approach" (see Murray, 1980; Raimes, 1985; and Zamel, 1982) from the researcher was also tracked. The nine drafts composed by each subject were analyzed and compared in order to determine the effect computer-based text analysis had on subjects' writing as compared with the effect of feedback characteristic of the process approach.

Research Questions

The purpose of this study was to determine what effect the computer-based text analysis program, Critique, had on the writing of two ESL 100 students. Specifically, the study set out to compare revisions encouraged by the computer-based text analysis program with revisions produced by writers using feedback from the researcher reacting to a text from a process approach to writing. Specific questions addressed by the study included:

1) What attitudes do ESL writers exhibit toward computer-based text analysis and its effect on their writing?
2) What types of revisions does Critique encourage subjects to make?
3) Do subjects using Critique make revisions other than those suggested by the program?
4) How do the revisions made by subjects using Critique

compare with those revisions made by subjects writing with the process approach?

5) Does the study suggest a place for computer-based text analysis in the writing process of ESL writers?

Subjects

Four ESL 100 students volunteered for the study. The students, all male, were second-semester freshmen enrolled in the same section of ESL 100. They volunteered for the study after learning it would involve writing with a computer. The students agreed to meet with the researcher one to one and one-half hours weekly for nine weeks.

Two of the subjects were Korean immigrants; two were Chinese. The subjects were placed into two groups so that each contained one Korean and one Chinese subject. Subject 1, a Korean immigrant who has lived in Hawaii for six years, was placed in the group using Critique, along with Subject 2, a Chinese immigrant from Vietnam who has lived in Hawaii for five years. Subject 3, a Korean immigrant who came to Hawaii five years ago, and Subject 4, a Chinese student from Hong Kong who has been in Hawaii for one year and who lived in Canada for two years prior to moving here, were placed in the control group. Table 1 lists the subjects' writing scores on the University of Hawaii placement test, along with TOEFL scores of two of the subjects.

Table 1. Subjects' placement test scores.

	Years in U.S.	Writing Placement Scores	TOEFL Score	TOEFL Writing Score
Subject 1	6	65	**	**
Subject 2	5	68	567	52
Subject 3	5	70	**	**
Subject 4	1*	69	550	50

*Plus two years in Canada
**Has not taken TOEFL

Materials

Though each subject regularly used word processing, each was familiar with a different word processing program and a different type of computer. Critique requires compositions which are IBM-compatible. In order to have subjects writing with the same word processing program and to create compositions compatible with Critique, the subjects were given two hours of training in the use of PFS:Write, a program generally noted for its simplicity and ease of use. During the orientation, the basic features useful for writing were stressed: deleting text, inserting text, moving text, and simply moving (the cursor) around within a text. At the conclusion of training, each subject expressed confidence in his ability to use the program.

In addition to training in the use of PFS:Write, orientation for the two subjects using the computer-based text analysis program included an introduction to Critique. Subjects

were familiarized with the procedure to upload a composition from the terminal to the mainframe. They were also familiarized with Critique's analyses. When Critique detects an error in a composition, the program places a one- or two-word message underneath the word or sentence that the program analyzes to be ungrammatical (see Appendix A). For example, if the writer has joined two independent clauses with a conjunction but has failed to separate the two with a comma, the message "MISSING COMMA" will appear beneath the conjunction. If the writer needs more specific information about the program's analysis, he presses the designated function key, "SHOW", and more information will be provided. This information is in the form of a one- or two-sentence explanation of the analysis. A more extensive explanation, similar to that found in a writing textbook, is provided by pressing the "SHOW" key again. If the writer decides to accept Critique's analysis and make the suggested changes, the program then re-analyzes the sentence. If no error is detected, no error message will appear.

Subjects were familiarized with techniques for revising a composition when using Critique were instructued in procedures for downloading a revised composition, along with the analysis provided by Critique, from the mainframe computer to an individual terminal. Procedures for saving the revised composition and Critique's analysis on a computer diskette were demonstrated.

Procedures

Each subject met individually with the researcher once a week. Before these sessions began, a set of instructional protocols were constructed (see Appendices B and C).[1] All four subjects were assigned the same theme ("problems and solutions") on which to write their compositions. The subjects using Critique wrote compositions with PFS:Write and, upon completion, uploaded their texts to the mainframe computer and revised them using Critique's analysis.

While subjects in the Critique group were writing their compositions, the researcher served only as an observer. When the first draft was completed, subjects were assisted in using the computer terminal for accessing Critique. Subjects used Critique's analysis to revise the first draft of their compositions, after which they were given opportunity to make other revisions with the word processing program. The second draft was then analyzed a final time by Critique. The role played by the researcher was one of observer and facilitator, allowing the text analysis program to be the sole intervener in the composing process. At the end of the third draft, the process was started again with another composition written on the general broad theme.

The control group used PFS:Write as the means to generate,

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[1]Dr. Martha Pennington of the University of Hawaii Department of English as a second language provided invaluable assistance in developing the instructional protocols and the general design of the study.

organize and refine ideas (see protocols, Appendix C). These subjects also met individually with the researcher weekly for nine weeks. The subjects wrote on the general theme, "problems and solutions." Unlike the group using Critique, however, this group interacted with and received feedback from the researcher from the beginning of the writing process to the end. The focus was on the process of writing: that is, the act of writing itself was viewed as a way of discovering meaning (Murray, 1980). Before writing, subjects discussed ideas for their compositions with the researcher. The researcher asked questions to help clarify and explore ideas (see Carnicelli, 1980; Sommers, 1982). The subject was then encouraged to write a first draft, paying little attention in the early stages to organization, instead concentrating on exploring ideas. As the subject worked from the first to the second to the final draft, this process of discovering and focusing on ideas was recycled. The researcher asked questions to encourage the subject to revise or re-see his composition in order to continue generating, organizing, and revising ideas.

The two approaches to the writing process pursued by the study were structured antithetically (see Appendices B and C). Subjects using Critique depended on an external monitor, the computer-based text analysis program, for feedback. As Critique can only deal with the input it receives and cannot deal with writing as a process, it is necessarily product-centered. The program focuses on structure and grammar, providing a syntactic

focus.

The subjects using the word processing program and receiving feedback from the researcher were steered toward dependence on an internal monitor. Feedback was structured so that a semantic focus--one centered on generating, organizing, and developing ideas--was paramount. Revision in such an approach is an integral part of the process of discovering and refining meaning. Taylor (1981) notes that writing itself can be as a facilitator of thought, serving to mold and refine ideas which are incomplete. Such an approach mitigates against the use of revision as only a tool for editing mechanical features. Revision instead is a powerful, integral tool of writing.

Analysis

Each draft was saved on a computer disk and later printed for analysis. Revisions between drafts were highlighted and coded (see Figure 1 below) in order to compare the types of revisions made by the two groups. At the conclusion of the study, each draft written by the word processing group was uploaded to the mainframe computer and analyzed by Critique. This was done so that Critique's summary analysis provided at the end of each analyzed composition could be compared with the summary analysis of the compositions written by the subjects revising solely with Critique. This summary includes the number of words, the number and types of verbs, the number and types of sentences, percentages of each, and a readability index calculated with the Flesch/Kincaid scale (see Appendix A).

Figure 1

Coding Categories*

Surface-Level Editing Changes		Revising Changes Affecting Meaning	
a	addition[2]	a	addition
del	deletion[3]	del	deletion
sub	substitution[4]	sub	substitution
sp	spelling	r	reorganization[6]
wf	word form	c	combination[7]
p	punctuation		
v	verb form or tense		
ss	sentence structure[5]		

*Adapted from Raimes (1985)

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[2]Refers to addition of a word [a(w)], phrase [a(phr)], or sentence [a(s)]. These coding symbols are used for cases of surface editing and for cases of revision affecting meaning. A special category is addition of a transition word (e.g., "moreover," "in conclusion," "in addition," etc.), designated [a(tw)]. These words are classed under surface editing changes, though an argument can be made of their affect on meaning. They are, at least, an "in-between" class.

[3]Refers to deletion of a word [del(w)], phrase [del(phr)], or sentence [del(s)]. These coding symbols are used for cases of surface editing and for cases of revision affecting meaning.

[4]Refers to substituting a word [sub(w)], phrase [sub(phr)], or sentence [sub(s)] for a previously used word, phrase, or sentence. These coding symbols are used for cases of surface editing and for cases of revision affecting meaning.

[5]Refers to a change in sentence structure which does not affect meaning.

[6]Refers to a major reorganization within a paragraph or across paragraphs which alters meaning.

[7]Refers to the combination of two sentences or paragraphs.

Findings

The discussion to follow focuses on subjects' attitudes toward Critique, the number of changes made by subjects in both groups, and the types of changes made by subjects in both groups. Subjects' attitudes toward Critique and toward using word processing with a process approach to writing is discussed. A comparison of Critique's summary analysis of each composition follows. Finally, the types of changes made by subjects in both groups are discussed.

Attitudes Toward Critique

The initial reaction of subjects using Critique was similar to that reported by Kiefer and Smith (1983). They were intrigued, even amazed, at the program's ability to parse their sentences and highlight misspellings, ungrammatical constructions, and subject-verb disagreement. Both subjects learned to use the program quickly, though Subject 2 seemed much more tentative when using the program in the beginning than did Subject 1. Twice during his first time using Critique, Subject 2 asked what a particular computer prompt meant. He also asked what he should do when the program labeled one of his sentences DIFFICULT. He did, however, become much more relaxed and confident in his ability to use the program with experience.

Critique is dubbed an "interactive" program, implying that there is a kind of "give-and-take" conversation between the program and the user. Though the analogy is not completely

accurate, Subject 2 did carry on a kind of conversation with himself when using the program. Sometimes when viewing the analysis provided by Critique, he would ask, "What's wrong with that?" After pushing the SHOW key and receiving an explanation of the analysis, he would often exclaim, "Oh, yeah," as if a light of understanding had been turned on.

Subject 1 was immediately at ease with Critique. He also expressed a great deal of initial enthusiasm for the program, inquiring if he could analyze his ESL 100 assignments and other writing projects with Critique. His enthusiasm, as the results of the survey given at the conclusion of the study (see Appendix D) and comments he made during the nine-week study indicated, waned as the study progressed. Subject 1 seemed particularly deflated when he learned that even though Critique underscored many of the grammar problems in his compositions, there were some grammar problems that the program obviously overlooked, and there were times when the program's analysis was simply incorrect. He seemed to realize that Critique was not an infallible guide that would make his writing faultless, and that seemed to disappoint him. His comments (see Appendix D) about whether the program made him a better writer, in contrast to those made by Subject 2, indicate that Subject 1 grew skeptical of the program's ability to improve his writing skills.

Subjects using the word processing program and writing from a process approach expressed how easy it was to make changes in their compositions with the computer as compared with more traditional modes of writing. When asked if the time spent

writing with the computer and receiving feedback from the researcher had proven helpful, both Subject 3 and Subject 4 responded positively. Subject 3 replied that he "used to write a paragraph and stop" without making further changes. In contrast, he stated that "now I know I have to go back and write more, add more ideas and make my writing clear." Subject 4, a more reluctant reviser than Subject 3, stated that the experience had caused him to be more conscious of the reader. He stated that the time spent writing on the computer and receiving feedback from the researcher had helped him to "think about what the reader of my paper will think when he reads." During the study, both subjects seemed to have internalized many of the tenets of the process approach.

A Comparision of Critique's Summary Analysis

A comparision of the summary analyses provided by Critique highlights some significant differences between the two groups. Subjects writing with a process approach wrote more on average than subjects revising with Critique. First drafts did not differ significantly in length, but second and third drafts show the process group expanding the length of their compositions significantly more than the subjects revising with Critique. Compositions written with Critique increased by only <u>ten</u> words or less from the first to the third draft. Half of the six compositions written by the Critique group were actually shorter on the third draft than on the first. Table 2 delineates the average differences in the number of words and sentences written

by subjects in the two groups. The average number of long and short sentences is also listed. Individual summary analyses of each draft are provided in Appendix E.

Table 2. Average length of compositions across drafts.

Subjects using Critique:

Compositions 1-3

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	4.7	4.7	4.7
Total number of sentences	32.3	32.5	34.0
Total number of words	533.7	535.7	532.0
Total number of short sentences*	6.7	7.2	7.8
Total number of long sentences**	3.8	4.0	3.3

Subjects using process approach:

Compositions 1-3

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	4.3	4.7	4.7
Total number of sentences	24.2	32.0	36.5
Total number of words	490.8	657.3	744.7
Total number of short sentences	1.2	1.8	2.7
Total number of long sentences	7.0	9.0	10.2

*Sentences of ten words or less
**Sentences of 25 words or more

In contrast to subjects revising with Critique, subjects in the process group increased the length of their compositions significantly. Subject 3's compositions increased an average of 400 words from the first to the third draft. Subject 4, a more reluctant reviser, increased by 100 words the length of his

compositions from the first to the third draft. This increase, though much less than that made by Subject 3, was ten times that of subjects using Critique.

Critique, like other text analysis programs, focuses on inter-sentential changes. The incentive for global changes, such as expanding an existing idea or adding a new one, is absent from the program. Rather than liberating these subjects to deal with content and meaning changes at the global level, Critique appears to have focused their attention on sentential, surface-level changes. The subjects using Critique appeared unable to move beyond that focus. They were, in Raimes' terminology, "trapped within the sentence. . .worried about accuracy. . .concerned with vocabulary and not with concepts" (1985, p. 83).

The number of sentences written from draft 1 to draft 3 highlights another difference between the two groups. Subject 1, revising with Critique, increased by an average of three the number of sentences he wrote from draft 1 to draft 3. Subject 2 increased the length of his compositions by less than <u>one sentence</u> from draft 1 to draft 3.

Subject 3, on the other hand, increased the length of his compositions by an average of 21 sentences from draft 1 to draft 3. The number of sentences written across drafts by subject 4, however, did not increase significantly. His compositions showed an average increase of only three sentences.

A final significant difference between the two groups is in the average number of short (<10 words) and long (>25 words) sentences written across drafts. The average number of short

sentences increased from 6.7 in the first draft to 7.8 in the third draft in compositions written by subjects using Critique. Subjects writing with a process approach wrote an average of 1.2 short sentences in their first drafts. The number of short sentences increased to 2.7 in their final drafts. On the other hand, the process group wrote an average of 7.0 long sentences in their first drafts; that number increased to an average of 10.2 long sentences in their final drafts. In comparison, subjects revising with Critique wrote an average of 3.8 long sentences in first drafts. The number of long sentences decreased to 3.3 in their final drafts. At least a part of that reduction can be attributed to Critique, which labels long sentences as DIFFICULT and in need of revision.

Classification of Changes

The types of revisions made by subjects in the two groups is another area of substantial difference (for a detailed summary, see Appendix F). Subject 3 made the most revisions of the four writers. Of the 152 revisions made by Subject 3, 64 (or 42%) were surface-level editing changes--that is, changes affecting surface structure only but not affecting or altering meaning. 88 (or 58%) of the changes made by Subject 3 were revisions--that is, changes which did alter or affect meaning. Subject 2's compositions contained the second most number of revisions. In contrast to those revisions made by Subject 3, 97% (or 140 of 144) of the changes made in Subject 2's compositions (which were revised using Critique) were surface-level editing changes. Only

4 of 144 total changes were revisions affecting meaning. It is also significant to note that only 18 (or 13%) of the changes made by Subject 2 were changes not prompted by Critique. Of those 18, only two were revisions which altered meaning.

The next largest number of changes were made by Subject 1. Subject 1's compositions contained a total of 85 changes. Of those 85, 72 (or 85%) were surface-level editing changes which did not alter or affect meaning. 13 (or 15%) of the changes were revisions affecting or altering meaning. In contrast to Subject 2, 31% (or 26) of the changes made by Subject 1 were not prompted by Critique. Of these, only five affected or altered meaning.

The fewest changes between drafts were made by Subject 4. Subject 4's drafts contained only 69 changes. Of these 69, 41 (or 59%) were changes affecting or altering meaning. 28 (or 41%) were surface-level editing changes. Table 3 summarizes the total number of revisions made by subjects in both groups.

Table 3. Total number and types of changes.

	Surface-Level Editing Changes	Revising Changes Affecting Meaning
Subject 1	72	13
Subject 2	140	4
Subject 3	64	88
Subject 4	28	41

A taxonomy of the changes suggested by Critique to the two subjects using the program is listed in Table 4. The program's

analyses are ranked by frequency of occurrence.

Table 4. Taxonomy of Critique's Analysis by Frequency of Occurrence.

Unrecognized word (spelling) - 98
Premodifier and noun probably disagree in number - 16
Missing comma after subordinate clause - 11
Improper form of the verb - 11
Possible sentence fragment - 10
Missing comma - 9
Missing hyphenation - 7
Sentence too difficult to process - 7
Possible missing comma in compound sentence - 6
Number disagreement between subject and verb - 6
Sentence may be unclear - 6
Possible missing comma after initial adverbial - 6
Sentence is too long - 5
Number disagreement between noun phrase and relative clause-4
Use of wrong indefinite article - 3
Number mismatch in noun phrase - 3
Improper form of infinitive - 3
Readability level too high - 3
Comma missing before subjunctive subordinate clause - 2
Infinitive is probably split - 2
Wrong pronoun in object position - 2
Missing question mark - 2
Possible excessive use of "and" - 2
Paragraph is too long - 2
Incorrect comma between conjoined phrases - 2
Lack of parallelism in verb phrase - 2
Probably too many nouns and adjectives preceding head noun- 2
Sentence begins with a coordinate conjunction - 1
Comma is probably unbalanced - 1
Confusion of semicolon and comma - 1
Confusion of possessive ('s) and plural (s) - 1
"Sort/kind of" is colloquial - 1
Possibly wrong pronoun in subject position - 1
Incorrect "is when" construction - 1
Probable confusion of "everyday" and "every day" - 1

Two final results concern, firstly, the analyses offered by Critique which were ignored by subjects using the program, and, secondly, the subjects' reactions to the program's analyses which

were incorrect.

The most frequent analyses offered by Critique which were not acted on by subjects using the program included: SENTENCE MAY BE UNCLEAR, SENTENCE IS TOO LONG, SENTENCE IS TOO DIFFICULT TO PROCESS, PARAGRAPH IS TOO LONG, and READABILITY LEVEL IS TOO HIGH. Significantly, these analyses do not offer the writer specific guidance for revision. Unlike other analyses which suggest, for example, the correct verb form or the position in which to place a comma, the analyses listed above do not tell the writer what to do. It was in these cases that the subjects using Critique were most likely to make no changes at all.

Critique, though quite accurate in most of its analyses, parses incorrectly on occasion and, subsequently, provides incorrect advice to the user. Dr. Robert Chandler, whose composition classes at the University of Hawaii used Critique during Spring semester 1988, estimates that the program is accurate in about 75% to 85% of the analyses it provides (personal communication, 1988). Critique's analyses of compositions written by subjects using the program for this study provided a total of 240 suggestions for revision. Of these 240--excluding incorrect analyses of spelling errors, where a rare word or brand name not included in the program's dictionary was used, and those cases in which the analysis was based on statistical data alone (e.g., SENTENCE MAY BE TOO LONG)--only 18 (or less than 10%) were incorrect. Of these 18, half were accepted by the subjects and incorporated into their compositions. Even though subjects were reminded each time they

used the program that the analysis provided by Critique is sometimes incorrect, they were not very successful in distinguishing those cases when the program's analysis was wrong.

Discussion

One of the criticisms aimed at computer-based text analysis has been that such programs may encourage writers to do little more than tailor their writing to fit the suggestions prompted by the program (Wresch, 1987, p. 67). This criticism is particularly cutting in those cases where the program's analysis is wrong, yet the writer makes the changes suggested. Both Subject 1 and Subject 2 had difficulty distinguishing those cases where the analysis provided by Critique was obviously wrong. Though repeatedly alerted to the fact that the program was sometimes wrong in its analyses, both tended to make the change suggested by Critique. For example, if the program claimed that a comma was missing, they would place a comma in the position suggested--even when the program, because of an incorrect parse, was wrong. Both appeared more interested in satisfying Critique and having it parse their sentences as "correct" (that is, having a sentence re-analyzed by Critique after a change was made and then having no error message appear) than they were in examining the validity of the program's suggestions. Subject 2 seemed to take particular satisfaction in making the changes suggested by the program and then seeing the sentence re-parsed and found free of error. Obviously, such reliance on the program as judge and

jury--particularly when an analysis has not done justice to a text--is dangerous, if not counter-productive.

Equally alarming is the fact that subjects revising with Critique apparently became trapped within the sentence (see Raimes, 1985). Rather than writing for meaning, they wrote to meet the standards of the computer program. These subjects primarily focused on Critique's analysis. They repaired sentences and left meaning unattended.

Conversely, subjects receiving feedback characteristic of the process approach did focus, to a large extent at least, on meaning. It is interesting to note, however, that even though the researcher never called attention to surface-level problems, subjects in this group gave attention to this area. The majority of the changes made by these subjects were revisions affecting meaning, but a significant number of changes were surface-level editing changes. This contradicts the contention that surface-level problems will go unattended if teachers focus primarily on writing as a process of discovering meaning. The types of changes made by subjects revising with Critique, however, do not support a counter-version of that argument.

Conclusion

In summary, subjects writing with Critique believed that the program improved their writing, though Subject 1 became less enthusiastic in this belief as the study progressed. Also, significant differences in the length of drafts written by the

two groups were found. Subjects receiving feedback characteristic of the process approach wrote significantly more than subjects revising with Critique. Finally, subjects focused on the process of writing made more revisions affecting meaning than did subjects using Critique. Subjects using Critique primarily made surface-level editing changes which did not affect meaning.

This study suggests that the optimism expressed for computer-based text analysis in previous studies may need, at the very least, to be tempered. It certainly suggests caution in any endorsement of computer-based text analysis as a writing aid for second language learners of English. Further study that involves a greater number of subjects must be completed before any definitive answers can be given to questions concerning what place, if any, computer-based text analysis has in ESL writing. This study suggests, not surprisingly, that computers alone are not yet capable of providing adequate guidance to ESL writers.

One area of study that this research suggests, and one that may prove promising for computer-based text analysis, concerns the final editing stages of the writing process. Research comparing feedback ESL students receive from tutors with feedback received from Critique may suggest an important role for computer-based text analysis as an editing tool for drafts in which surface-level problems are the sole focus. As text analysis programs become more and more accurate in analyzing syntax, such a role may prove plausible.

Critique marks the advent of a new generation of computer-

based text analysis programs which are capable of dealing with natural language and analyzing syntactic structure with a high level of sophistication. As this technology develops, more and more ESL teachers will be confronted with opportunties for incorporating computer-based text analysis into their classrooms. This research suggests that these opportunities need to be approached with caution and careful consideration. Computer-based text analysis may prove to be a powerful and productive tool for ESL writers. In and of themselves, however, text analysis programs seem as yet unable to improve second language writing significantly.

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Appendix A

CRITIQUE annotated output for AIDS CRTQ *

One of the major problems we face in United State is
Aids. What is AIDS anyway? AIDS is a virus that attacts the
<1 SPELL>
immune system in our body. Why is that we Americans make big
<2 FRAGMENT?
issue of AIDS? Is it because AIDS have great impact on
2>
everyone? Yes because it is matter of life and death for
those who has AIDS and for those who doesn't have AIDS. This
overhelming disease has no mercy for AIDS victims. It not
<3 SPELL 3>
necessary that AIDS will be spread just by body contact or
sharing of utencils such as toilet or being with the person
<4 SPELL>
who has the symptom of AIDS virus. I think that catching
<5 DIFFICULT
AIDS could have been prevented only if everyone have the
knowledge of what is AIDS and what causes AIDS and what is
the effect when you have an AIDS. There is many ways of
5>
catching AIDS but majorities of the people who have AIDS has
recieved AIDS is through unprotected sex, introvaineous drug
<6 SPELL> <7 SPELL 7>
and infected woman passing AIDS during childs birth.
<8 SPELL>

Aids is spread through unprotected sex such as, not using
condom or having sex with more than one person. It means
<9 SPELL>
it will increase the chance of passing AIDS or recieving
<10 SPELL>
AIDS. AIDS is usually spread when opposite sex or same sex
<11 TOO MANY MODS>
exchanges body fluid through any means of intercourse. Also
<11> <12
FRAGMENT?
happens when there is a tare on the outer skin of the sex
<14 MISSING COMMA?> <13 SPELL>
while doing sex. It is very obvious that it is more likely
12>
to catch AIDS when a person does not use condom while having
<15 SPELL>
sex with more than one person. Another way of catching AIDS
<16 MISSING COMMA> <17 FRAGMENT?
through deep wet kissing with sore on the mouth.
17>

Another way of catching Aids is through sharing of needle.
It usually occurs to those who use drug by injecting needle

into their vain and passing it to another drug user to use the same needle. While sharing needle, small amount of blood is being carry to another drug user. This small amount of blood might hold AIDS virus which could be transmitted to another drug user. It is more likely to recieve AIDS because
<18 SPELL>
needle is been injected directly into the vain.
<19 MISSING COMMA?>
Another way of passing AIDS is when an infected mother gives
<20 UNCLEAR? <21 USAGE>
<21>
birth to a child. It passed to a child as how gene is been
20>
passed down to a child. This AIDS is just as bad as catching
<22> <22 AID>
from another person through sex or sharing of needle with another AIDS victims. This is very unfair for the child
<23 23> <23 victim>
because a child usually dies around after two years. The child dies because his or her immune system is taken over by AIDS virus and can not fight of other foreign disease which helps to speed up the death of a child.

In conclusion you will find that AIDS is a serious matter to those already have AIDS virus. To them it is a life and death and fighting everyday of their life to vanish AIDS
<24 USAGE?>
virus. Scientists are studying and careful research to come up with the cure but it is very difficult and unable to find any cure for the AIDS victims. My advice for other as well as myself is to learn more about AIDS.

CRITIQUE annotated output for AIDS CRTQ *

1. UNRECOGNIZED WORD
   attracts
   attacks
   attract
   attaches
2. POSSIBLE SENTENCE FRAGMENT
   This segment of text may not be a complete sentence. Make sure that it has a subject and verb, and that it is correctly worded.
3. UNRECOGNIZED WORD
   overwhelming
4. UNRECOGNIZED WORD
   utensils
5. SENTENCE TOO DIFFICULT TO PROCESS
   This sentence is too long or too complex for CRITIQUE to process. It should probably be simplified.
6. UNRECOGNIZED WORD
   received

relieved
receiver
receives

7. UNRECOGNIZED WORD
interpolating
interrogating
extraneous
interleaving
interlocking
interplaying

8. UNRECOGNIZED WORD
chills
child
chides
childish
childly
chilies

9. UNRECOGNIZED WORD
condor
condemn
condole
condone
condors
conform

10. UNRECOGNIZED WORD
receiving
relieving

11. TOO MANY NOUNS AND ADJECTIVES PRECEDING THE HEAD NOUN
Consider eliminating some of the underscored words or moving them to the right of the head noun.

12. POSSIBLE SENTENCE FRAGMENT
This segment of text may not be a complete sentence. Make sure that it has a subject and verb, and that it is correctly worded.

13. UNRECOGNIZED WORD
take
tale
tame
tape
tars
tart

14. COMMA PROBABLY MISSING BEFORE SUBJUNCTIVE SUBORDINATE CLAUSE

Insert a comma after the underscored word.

15. UNRECOGNIZED WORD
condor
condemn
condole
condone
condors
conform

16. MISSING COMMA AFTER SUBORDINATE CLAUSE
Insert a comma after the underscored word (or before the new clause).

17. POSSIBLE SENTENCE FRAGMENT
    This segment of text may not be a complete sentence. Make sure that it has a subject and verb, and that it is correctly worded.
18. UNRECOGNIZED WORD
    receive
    received
    receiver
    receives
    relieve
19. COMMA PROBABLY MISSING AFTER SUBORDINATE CLAUSE
    Insert a comma after the underscored word (or before the new clause).
20. SENTENCE MAY BE UNCLEAR
    CRITIQUE has identified multiple structures for this sentence. You may want to rephrase it to make it clearer.
21. INCORRECT "IS WHEN" CONSTRUCTION
    Consider using "that" or a noun (such as "the case," "the time") instead of "when." It is also possible to use a different verb instead of "is."
22. NUMBER DISAGREEMENT BETWEEN PREMODIFIER AND NOUN
    AID
23. NUMBER DISAGREEMENT BETWEEN PREMODIFIER AND NOUN
    victim
24. PROBABLE CONFUSION OF "EVERYDAY" AND "EVERY DAY"
    Replace EVERYDAY with EVERY DAY

SUMMARY ANALYSIS
File:
  Flesch/Kincaid readability level 7.71
  Total number of paragraphs 5
  Total number of headings 0
  Total number of sentences 30
  Total number of words 540
  Total number of verbs 63
  Total number of passive verbs 5
  Average number of syllables per word 1.38

Paragraphs:
  Total number of paragraphs 5
  Average paragraph length in words 108
  Average paragraph length in sentences 6
  Shortest paragraph in words 76
  Shortest paragraph in sentences 4
  Longest paragraph in words 173
  Longest paragraph in sentences 10

Sentences:
  Total number of sentences 30
  5 Short (10 words or fewer)
  7 Long (25 words or more)
  17 Simple
  12 Complex

0 Compound
1 Compound-complex
28 Active
2 Passive
28 Declarative
0 Imperative
2 Interrogative
0 Mixed
Average sentence length in words 18
Shortest sentence in words 4
Longest sentence in words 33

Percentages:
7% of the verbs are passive verbs
16% of the sentences are short
23% of the sentences are long
56% of the sentences are simple
40% of the sentences are complex
0% of the sentences are compound
3% of the sentences are compound-complex
93% of the sentences are active
6% of the sentences are passive
93% of the sentences are declarative
0% of the sentences are imperative
6% of the sentences are interrogative
0% of the sentences are mixed

Appendix B

Subjects Using Critique

Will	Will not
Discuss suggestions offered by the computer (though not offering advice)	Discuss matters of content, organization, transition, or coherence
Help the subject understand the anaylsis offered by Critique by explaining program meta-language	Point out any problem area not "flagged" by Critique
Make sure the subject knows how to use the program thoroughly	Engage in pre-writing or other tutoring activities designed to aid the writer in clarifying his ideas
Help the subject input whatever changes he accepts from Critique's analysis	The emphasis is on using the computer as the primary, if not sole, writing tutor. My role is simply to facilitate the subjects' use of the computer and to observe the types of revision that occur when the Critique text analyser is used in by an ESL writer.
The emphasis is on using Critique from beginning to end, focusing on using the computer's analysis for decisions concerning revision and clarification of the writing. When asked about issues of content,organization, or any issue raised that has not been raised by Critique, I'll ask, "What does Critique say?"	

Appendix C

Subjects using a word processor

Will	Will not
Prewriting exploration of ideas, i.e. talking out ideas	Correct punctuation, spelling, grammar
Encourage "free writing"	Correct fragments or run-on sentences
Ask questions that help to generate and refine ideas	Demand action verbs, delete "be" verbs, expunge passives
Ask about focus	Demand sentence length variety
Ask about audience	Combine sentences, subordinate ideas
Ask about purpose	Correct case usage (who/whom, pronouns)
Ask students to "nutshell" ideas and purpose	Cross-out wordiness
Work on organization of ideas	Correct subject-verb "disagreement"
Ask students about logical progression	Correct tense or person shift
Ask questions about word choice (only) if meaning is unclear	Place misplaced modifiers
Discuss introductions and conclusions	Fix mixed metaphors
Work on coherence of ideas and transition between ideas in a general way	Fix "un"-parallel structures
	Correct, suggest idioms
The key is to always encourage the subjects to use the computer to insert, delete, and move ideas. The focus is on using the computer to generate, organize, and refine ideas. The emphasis is on the process of writing: that is, to generate, organize and refine ideas.	Correct any matters of mechanics or style that do not obscure meaning. Sentence-level problems are considered no problem unless they confuse or obstruct the transfer of meaning.
	When asked about these, I'll ask, "What do you think is best?"

Appendix D

Subjects' Evaluation of Critique

S1=Subject 1
S2=Subject 2

1.	Did you find Critique easy or difficult to use?	easy					difficult
		5	4	3	2	1	
	S1=4; S2=4		xx				
2.	Were the suggestions given to you by the program easy or difficult to use?	easy					difficult
		5	4	3	2	1	
	S1=4; S2=4		xx				
3.	Was it easy or difficult to make changes in your composition when using Critique?	easy					difficult
		5	4	3	2	1	
	S1=5; S2=3	x		x			
4.	In general, did you find the suggestions given to you by Critique to be helpful or not?	helpful					not helpful
		5	4	3	2	1	
	S1=5; S2=5	xx					
5.	In general, how much do you think using Critique improved your compositions: a lot or none?	a lot					none
		5	4	3	2	1	
	S1=4; S2=5	x	x				
6.	If you have the opportunity to use Critique in the future, do you think you will do so?	yes					no
		5	4	3	2	1	
	S1=5; S2=5	xx					
7.	Do you think other students at UH would find Critique helpful to their writing?	yes					no
		5	4	3	2	1	
	S1=4; S2=5	x	x				
8.	Would you recommend Critique to other students?	yes					no
	S1=4; S2=5	5	4	3	2	1	
		x	x				

Appendix D (continued)

9. In using Critique, what did you find most helpful?

   S1: "Subject verb agreement, fragment, and correcting spelling errors."

   S2: "The tree function is great."

10. In using Critique, what did you find least helpful?

   S1: "Getting into the program."

   S2: "Some comment on error are not very helpful."

11. How did using Critique improve your writing (if you think it did)?

   S1: "It helped me to write clear sentences, without having problems in SVA or fragment."

   S2: "I became very careful in tense using, and spelling."

12. What would make Critique more helpful to your writing?

   S1: "None that I can think of. I think it is fascinating how it corrects sentences."

   S2: "A more precise explanation on a verb's tense usage."

13. Did you like using Critique? Why or why not?

   S1: "Yes. The reason for that is because it help me to write and to be open minded. It helped me to think and put down your own ideas on the screen and let the computer correct the mistakes."

   S2: "Yes, I like using Critique. Because I can correct my writing error with out penalty."

14. Has using Critique made you a better writer? If yes, how?

   S1: "So so. I need to write more than I normally write. The more I write, the better writer I will be."

   S2: "May be, I'm begin to pay attention more on verb tense when I write my paper."

Appendix E

Subject 1

Composition #1

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	4	4	4
Total number of sentences	18	19	19
Total number of words	338	348	344
Total number of verbs	52	51	48
Total number of short sentences*	1	1	1
Total number of long sentences**	4	3	3
Percent of short sentences	5%	5%	5%
Percent of long sentences	22%	15%	15%

Composition #2

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	5	5	5
Total number of sentences	25	25	30
Total number of words	548	549	529
Total number of verbs	78	79	85
Total number of short sentences	2	2	7
Total number of long sentences	6	6	4
Percent of short sentences	8%	8%	23%
Percent of long sentences	24%	24%	13%

Composition #3

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	5	5	5
Total number of sentences	30	31	33
Total number of words	540	535	531
Total number of verbs	63	65	68
Total number of short sentences	5	7	8
Total number of long sentences	7	7	6
Percent of short sentences	16%	22%	24%
Percent of long sentences	23%	22%	18%

*Sentences of 10 words or less
**Sentences of 25 words or more

Appendix E (continued)

Subject 2

Composition #1

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	5	5	5
Total number of sentences	29	29	29
Total number of words	467	469	469
Total number of verbs	55	54	55
Total number of short sentences	6	6	6
Total number of long sentences	2	2	2
Percent of short sentences	20%	20%	20%
Percent of long sentences	6%	6%	6%

Composition #2

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	4	4	5
Total number of sentences	33	33	35
Total number of words	486	491	497
Total number of verbs	69	70	71
Total number of short sentences	9	9	9
Total number of long sentences	1	2	1
Percent of short sentences	27%	27%	25%
Percent of long sentences	3%	6%	2%

Composition #3

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	5	5	5
Total number of sentences	59	58	58
Total number of words	823	822	822
Total number of verbs	109	110	106
Total number of short sentences	17	18	17
Total number of long sentences	3	4	4
Percent of short sentences	32%	31%	29%
Percent of long sentences	5%	6%	6%

Appendix E (continued)

Subject 3

Composition #1

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	2	5	5
Total number of sentences	17	34	39
Total number of words	315	627	717
Total number of verbs	50	98	108
Total number of short sentences	1	4	4
Total number of long sentences	5	8	8
Percent of short sentences	5%	11%	10%
Percent of long sentences	29%	23%	20%

Composition #2

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	5	5	5
Total number of sentences	23	36	49
Total number of words	361	692	864
Total number of verbs	56	107	129
Total number of short sentences	3	4	9
Total number of long sentences	2	9	12
Percent of short sentences	13%	11%	18%
Percent of long sentences	8%	25%	24%

Composition #3

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	5	5	5
Total number of sentences	34	50	50
Total number of words	699	983	987
Total number of verbs	109	160	159
Total number of short sentences	1	2	3
Total number of long sentences	9	10	11
Percent of short sentences	2%	4%	6%
Percent of long sentences	26%	20%	22%

Appendix E (continued)

Subject 4

Composition #1

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	6	5	5
Total number of sentences	24	25	30
Total number of words	501	519	668
Total number of verbs	48	49	69
Total number of short sentences	0	0	0
Total number of long sentences	7	7	10
Percent of short sentences	0%	0%	0%
Percent of long sentences	29%	28%	33%

Composition #2

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	3	3	3
Total number of sentences	24	25	26
Total number of words	464	517	565
Total number of verbs	62	68	74
Total number of short sentences	2	1	0
Total number of long sentences	6	6	7
Percent of short sentences	8%	4%	0%
Percent of long sentences	25%	24%	26%

Composition #3

	Draft 1	Draft 2	Draft 3
Total number of paragraphs	5	5	5
Total number of sentences	23	22	25
Total number of words	605	606	667
Total number of verbs	61	62	64
Total number of short sentences	0	0	0
Total number of long sentences	13	14	13
Percent of short sentences	0%	0%	0%
Percent of long sentences	56%	63%	52%

Appendix F

Number and Types of Changes Made Between Drafts

Subject 1

Composition #1: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
a - 2(w)	a - 2(phr); 1(w)
sub - 3(w)	
sp - 5	
wf - 2	
p - 4	
v - 1	
Total: 17	Total: 3

Composition #1: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
del - 1(phr)	sub - 1(phr)
sub - 1(phr); 1(w)	
p - 1	
Total: 4	Total: 1

Composition #2: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
sub - 1 (w)	
sp - 3	
p - 6	
v - 2	
Total: 12	Total: 0

Appendix F (continued)

Composition #2: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
a - 2(w); 1(tw)	a - 1(phr)
del - 4(w); 4(phr)	del - 1(phr)
sub - 3(w)	sub - 1(s); 1(phr)
wf - 3	
p - 3	
ss - 1	
Total: 21	Total: 4

Composition #3: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
a - 2(w)	a - 2(phr)
del - 1(w)	del - 1(phr)
sub - 1(w)	sub - 1(s); 1(w)
sp - 6	
wf - 1	
p - 3	
Total: 14	Total: 5

Composition #3: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
del - 1(w)	
p - 2	
ss - 1	
Total: 4	Total: 0

Total Number of Changes Made by Subject 1: 85

Surface-Level Editing	Revisions Affecting Meaning
Total: 72 (or 85%)	Total: 13 (or 15%)

Appendix F (continued)

Number and Types of Changes Made Between Drafts

Subject 2

Composition #1: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
a - 1(w)	
sub - 1(w)	
sp - 20	
wf - 7	
p - 1	
v - 5	
Total: 35	Total: 0

Composition #1: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
del - 1	
wf - 1	
v - 2	
Total: 4	Total: 0

Composition #2: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
sub - 1(w)	
sp - 11	
wf - 5	
p - 3	
v - 7	
ss - 1	
Total: 28	Total: 0

Appendix F (continued)

Composition #2: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
del - 1(w)	a - 1(phr)
sub - 3(w)	sub - 1(phr); 1(w)
sp - 3	
wf - 1	
p - 1	
v - 3	
Total: 12	Total: 3

Composition #3: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
del - 1(w)	c - 1
sp - 33	
wf - 3	
p - 5	
v - 2	
Total: 44	Total: 1

Composition #3: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
del - 1(w)	
sub - 1(phr)	
sp - 4	
wf - 2	
p - 4	
v - 5	
Total: 17	Total: 0

Total Number of Changes Made by Subject 2: 140

Surface-Level Editing	Revisions Affecting Meaning
Total: 140 (or 97%)	Total: 4 (or 3%)

Appendix F (continued)

Number and Types of Changes Made Between Drafts

Subject 3

Composition #1: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
a - 1(w)	a - 15(s); 1(phr)
del - 4(w)	del - 1(s); 3(phr); 1(w)
sub - 3(w)	sub - 5(w)
sp - 2	r - 3
wf - 2	
Total: 12	Total: 29

Composition #1: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
a - 3(w); 2(tw)	a - 4(s); 2(phr); 1(w)
del - 3(w)	del - 1(w)
sub - 3(w)	sub - 1(w)
sp - 1	r - 1
wf - 4	p - 1
p - 1	
Total: 17	Total: 11

Composition #2: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
wf - 1	a - 14(s); 1(phr); 1(w)
v - 1	sub - 1(phr); 1(w)
Total: 2	Total: 18

Appendix F (continued)

Composition #2: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
a - 1(w)	a - 10(s); 1(phr); 2(w)
del - 1(w)	del - 1(w)
sp - 1	sub - 1(w)
wf - 1	
Total: 4	Total: 15

Composition #3: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
a - 1(w)	a - 15(s)
del - 1(w)	del - 1(phr)
wf - 3	sub - 1(phr); 1(w)
p - 4	
v - 3	
Total: 12	Total: 18

Composition #3: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
a - 4(w)	a - 2(phr); 1(w)
del - 2(w)	sub - 4(w)
sub - 2(w)	
wf - 4	
sp - 2	
p - 1	
v - 2	
Total: 17	Total: 7

Total Number of Changes Made by Subject 3: 152

Surface-Level Editing	Revisions Affecting Meaning
Total: 64 (or 42%)	Total: 88 (or 58%)

Appendix F (continued)

Number and Types of Changes Made Between Drafts

Subject 4

Composition #1: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
a - 1(tw)	a - 1(s)
	sub - 1(phr); 1(w)
	r - 1
Total: 1	Total: 4

Composition #1: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
a - 3(w)	a - 6(s); 3(phr); 1(w)
sub - 1(w); 1(tw)	del - 2(phr)
p - 1	sub - 1(s); 4(phr)
v - 2	
Total: 8	Total: 17

Composition #2: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
a - 2(w)	a - 2(s); 2(phr)
v - 1	del - 1(s)
	sub - 2(w)
Total: 3	Total: 7

Composition #2: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
a - 4(w)	a - 4(phr)
del - 1(w)	del - 1(phr)
wf - 1	sub - 1(phr)
Total: 6	Total: 6

Appendix F (continued)

Composition #3: From Draft 1 to 2

Surface-Level Editing	Revisions Affecting Meaning
a - 2(w)	
del - 1(w)	
sub - 1(w)	
p - 1	
v - 1	
Total: 6	Total: 0

Composition #3: From Draft 2 to 3

Surface-Level Editing	Revisions Affecting Meaning
del - 1(w)	a - 4(phr); 1(w)
sub - 1(w)	del - 1(phr)
sp - 1	sub - 1(w)
p - 1	
Total: 4	Total: 7

Total Number of Changes Made by Subject 4: 69

Surface-Level Editing	Revisions Affecting Meaning
Total: 28 (or 41%)	Total: 41 (or 59%)